

Why care about computers?

LECTURE
SUMMARY

PRE-PROGRAMMING

Covered in this lecture:

Why it's useful to learn this

- ▶ Although everyone uses computers, few people actually know how they work
- Programmers are very well paid
- If you want to learn how to program, you need to know the basics of computers first
- It will help you understand how computers communicate

See you next lecture!

What is a computer?

LECTURE
SUMMARY

PRE-PROGRAMMING

Covered in this lecture:

What computers are and what they do

- ▶ A computer is anything that can compute, which means it can determine an amount or number when given certain rules
- ▶ Things that are technically computers: calculators, watches, wearables, cash registers, etc.
- ▶ Your brain is also a kind of computer
- Computers can solve problems
- They take instructions, run calculations, and give you a solution
- Computers are all around you

See you next lecture!

How does a computer work?

LECTURE
SUMMARY

PRE-PROGRAMMING

Covered in this lecture:

How computers do what they do

- ▶ Without humans to operate the computers, they're just dumb machines that don't do anything
- ▶ By giving them specific instructions and commands, humans are communicating with the Central Processing Unit (CPU), the core of the computer, where the problem gets solved
- ▶ CPUs = tiny silicon boxes attached to the motherboard
- ▶ There are only two companies that make CPUs for personal computers: Intel and AMD
- ▶ Within these squares there are thousands of transistors that are microns in diameter
- A transistor is a wire that can transfer electricity
- The smallest CPU transistor is 0.05 microns

- A processor is like a small calculator. It transfers electricity in circles, which we call a clock, and is measured in MIPS (Millions of Instructions Per Second)
- ▶ Computers have permanent and temporary memory
- Permanent memory is build in the form of a hard drive which stores your files
- Temporary memory is called RAM (Random Access Memory), and here the information is stored just for the duration of the program you're running

See you next lecture!

How do computers send & receive information?

LECTURE
SUMMARY

PRE-PROGRAMMING

Covered in this lecture:

How computers communicate

- ▶ In the world of computing there are tons of peripherals: monitors, keyboards, mice, track pads, etc.
- ▶ Peripherals are external devices that allow you to give your computer input
- ▶ The computer receives the input and responds with an output on the monitor
- As a programmer, the code you write is the input that the computer receives
- The response will depend on your coding abilities

See you next lecture!

Machinespeak & The Matrix

LECTURE
SUMMARY

PRE-PROGRAMMING

Covered in this lecture:

The language of computers

- ▶ Computers have their own language called machine code, which is really hard to understand for humans
- ▶ Peripherals and other devices communicate through machine code
- ▶ The simplest version of machine code consists of 0s and 1s (beeps and boops), also called a binary system
 - 1 = Yes, 0 = No
- ▶ The motherboard transfers messages to the processor by sending electricity through the wires in the board
- Letting electricity go is a 1 and stopping it is a 0
- In a second, it can send close to a million 0s and 1s
- The original computers were giant tubes, and they were using air instead of electricity (not that efficient)

► **There is a spectrum of programming code, from low level to high level code**

● **Low level code:**

- used by basic system and basic pieces of hardware
- long, inefficient, hard to read or write
- infinitely customizable
- machinespeak is the ultimate low level code

● **Mid level code:**

- used by peripherals
- slightly higher level than 0s and 1s
- peripherals might require a driver to be installed
- a driver is an interpreter that translates your input for your system

● **High level code:**

- used by programmers
- designed to make things faster
- shorter, easier to read
- less descriptive and more restricted

See you next lecture!

What is an operating system?

LECTURE
SUMMARY

PRE-PROGRAMMING

Covered in this lecture:

What operating systems are and the first operating system ever

- ▶ **Operating systems are interpreters that allow you to communicate with the computer**
- ▶ Before operating systems, only highly technical people could use computers
- ▶ Operating systems were the world's first software
- A software is an application or a system of instructions and logic that exists within the hardware and is used to control the hardware
- ▶ The first operating system was MS-DOS (Microsoft Digital Operating System):
 - it was a black screen where you typed in commands to do certain tasks
 - you had to remember the commands and where the programs you want to use are stored
- MS-DOS was taking your high level instructions and translating them to low level code

See you next lecture!

Operating systems in the modern era

LECTURE
SUMMARY

PRE-PROGRAMMING

Covered in this lecture:

How operating systems evolved

- ▶ In the 1980s, Bill Gates and Steve Jobs were fighting over how to make MS-DOS better
- ▶ Steve Jobs copied the idea from Xerox, which came up with the GUI (Graphic User Interface)
- ▶ Before GUI, operating systems were text based user interfaces
- ▶ After seeing the GUI, Steve Jobs created Macintosh and packaged it in an attractive way for the average consumer
- Computers used to be popular only among hobbyists, but after operating systems came out, everybody could easily use them
- There are 3 main operating systems today: Windows, MacOS, and Linux

- Windows' mission was to make an operating system that appeals to everyone
- MacOS is even easier to use and more restricted
- Linux is free (open source), anyone can modify it, and it's used mostly by technical people who want to have more control over the software
- Other operating systems that are similar to Windows: Ubuntu and Fedora

See you next lecture!

Desktop software

LECTURE
SUMMARY

PRE-PROGRAMMING

Covered in this lecture:

What desktop software is and what it does

- ▶ "Desktop" refers to your operating system. Your computer's desktop is where you keep files and folders
- ▶ **Desktop software = Software that you can open from your desktop**
- ▶ Software translates everything you do for the hardware
- MacOS and Windows have different machine code, so you have to make specific software for each of them
- ▶ Within the hardware of your computer runs an operating system, and the operating system runs desktop software
- All these systems have to communicate between them
- You can think of these like layers

- Apple used to make all the apps that run on a Mac, but now they give you the option to use other versions of the same tools

They have transformed into a platform

- Platform = Software environment where anyone can create something that runs on it
- ▶ Nowadays, almost every device is a platform that you can install apps on (phone, watch, TV)

See you next lecture!